

# Epilog

Denver Colorado, USA

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Owner's Manual for EPILOG Model 1000/25A Laser Engraver  
Revision B

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SECTION ONE: Unpacking your machine

### Unpacking

To unpack your machine, cut the black straps on the outside of the container. Using a small prybar or screwdriver, separate the cardboard box from the pallet by removing the staples around the base of the box. Lift the box clear. Remove the four hold down bolts on the plywood clamps. Remove the accessories kit and lift the machine off the pallet. It weighs about 140 pounds. There is a package of leveling screws taped to the pallet, which should be installed now in each of the four corners of the machine.

### You Should Have:

- 1 Model 1000/25 Laser Engraving Machine
- 2 Power Cords
- 1 Owner's Manual
- 1 Magnet kit
- 1 Printer Cable
- 1 Focus Gauge (Plastic Tube)

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SECTION TWO: Site requirements / Computer Configuration

## Site Requirements

- One duplex outlet, 115 Volts ac, 15 Amp Service  
(machine rated 95 - 130 Volts ac)
- Personal Computer using a 386 or 486 Processor (286  
Not Recommended)  
MS-DOS Version 3.1 or higher  
Windows Version 3.0 or higher  
640k RAM (256k extended recommended)  
One 5.25 1.2M floppy and a hard disk  
or  
One 3.5 1.44M floppy and a hard disk  
VGA or Super VGA Monitor & adapter  
Microsoft or compatible mouse  
Graphics software

OR

- Macintosh using a 68030 or 68040 Processor  
System 7.1  
Graphics software
- Smoke Vent  
The engraving process produces smoke and particulates that must be removed. There is an exhaust blower inside your engraver, with a port on the rear of the machine for connecting a four inch flexible hose. The hose must vent to the outside of your building. More information is provided in the setup section of this manual.

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## SECTION THREE: Software

## Software

Your EPILOG engraver has been designed to work with a standard desktop publishing systems. Both IBM compatible and MACINTOSH computers can be used. You should take time to familiarize yourself with the operation of Windows if you are a new user. In the following discussion, click and double click refer to selecting a screen item with the mouse.

### IBM and Compatibles:

The computer must be configured with MICROSOFT WINDOWS and a graphics package of your choice. Many good packages are available, and most of the popular programs have been tested and found to be compatible. Epilog cannot test every available package however, and compatibility cannot be assured. We have found CORELDRAW to be the most productive and easiest to learn.

Once you have installed WINDOWS and CORELDRAW, the computer must be configured to run the engraver. Your EPILOG laser engraver has two different operating modes. They are commonly referred to as Raster and Vector. Raster is used for virtually all of your engraving, and is your only choice if you include scanned artwork in your designs. Vector is typically used only for cutting or outlining. EPILOG recommends that you start using the machine in Raster mode at first, and add the Vector mode as you become more comfortable.

RASTER MODE: Start WINDOWS. Find the Control Panel icon (located in the "Main" window). Double click on the icon, and then double click on the Printer icon. The exact form of the printer control (dialog) box will vary slightly depending on the version of Windows on your computer. You should see a group of control functions on the right side of the dialog box. One of the them will be "Add", which is how a new printer driver is added. click on "Add". The computer will provide a long list of available drivers. Using the mouse, locate and click on the HP Laserjet 2000. Click on install. The computer may or may not ask for a specific Windows disk. Be sure to have them handy. If you have been successful, the laserjet 2000 should now appear on the list of installed printers, which is at the top of the print box. Now you should double click on the laserjet 2000 to select it, and then click on the "Setup" function. Use the mouse to set the paper size to 11 X 17 (ledger), the resolution to 300 DPI, and the orientation to portrait. Click on OK. Now click on the "Connect" function, and select an LPT port suitable for your system. Normally this would be LPT1. Verify that the "Default" printer is the laserjet 2000, and then click on the "Close" function. You're now ready to print.

Vector: Follow the Raster instructions above until you get to the point where you have just clicked on the "Add;

function. From the list of printers locate and select with the mouse the HP7475A. Now click on the "Install" function. The computer will ask for a specific Windows disk. If you are successful, an HP plotter should appear on the list of installed printers. Double click on the HP plotter to select it. Now click on the "Setup" function and set the device to HP7475A, the paper size to "B", the orientation to portrait, and select "preloaded". Click on OK, and then select the "Connect" function. Select the LPT port that your engraver is connected to (usually LPT1). Click on OK, and then click on close.

**Selecting RASTER or VECTOR:** To select the print mode from CORELDRAW click on print from the "File" menu. Click on "print(er) setup". If you select the Laserjet 2000 driver you will get a RASTER output. If you select the HP Plotter driver you will get a VECTOR output. **Generally, you should never print a vector file with any filled objects. They should be outlines only, with a line width of .003" or less.**

**MACINTOSH:** Printing to the Epilog engraver from a Macintosh requires two things. The first is "Freedom of the Press" software. This is available in several flavors, and Epilog has found the least expensive version to be satisfactory. Freedom of the press intercepts the laserwriter print commands and adjusts them to be compatible with the engraver. Follow the instructions in the freedom of the

press manual to install the software. The printer you should select is the HP laserjet 2000, with high resolution and a paper size of 11 x 17. The second item you will need is a physical connection to the engraver. This can be done in one of two ways. The best way is to add a parallel board to your Mac. The board tested and recommended by Epilog is the NATIONAL INSTRUMENTS NB-PRL, part number 180820 -01. National can be reached directly at 1 800 433 3488. Adding a board requires a Mac with at least one free NUBUS slot. If your Mac doesn't have a slot, the PARALINK from Jonathan Freeman Technologies is the only option. The Paralink is normally available at larger computer stores. Printing to the engraver can be a very time consuming task on a slower Mac. Epilog recommends at least a 68030 based machine. If you are using the parallel board, then the cable shipped with the engraver will provide the connection from the Mac to the engraver. If you are using the Paralink, the Paralink connects to the engraver on one end, and the **modem** port of the Mac on the other. If you have successfully installed the Freedom of the press software, printing should show a destination of FP Spooler. If the destination appears as Laserwriter or something similar, your installation needs to be reviewed.

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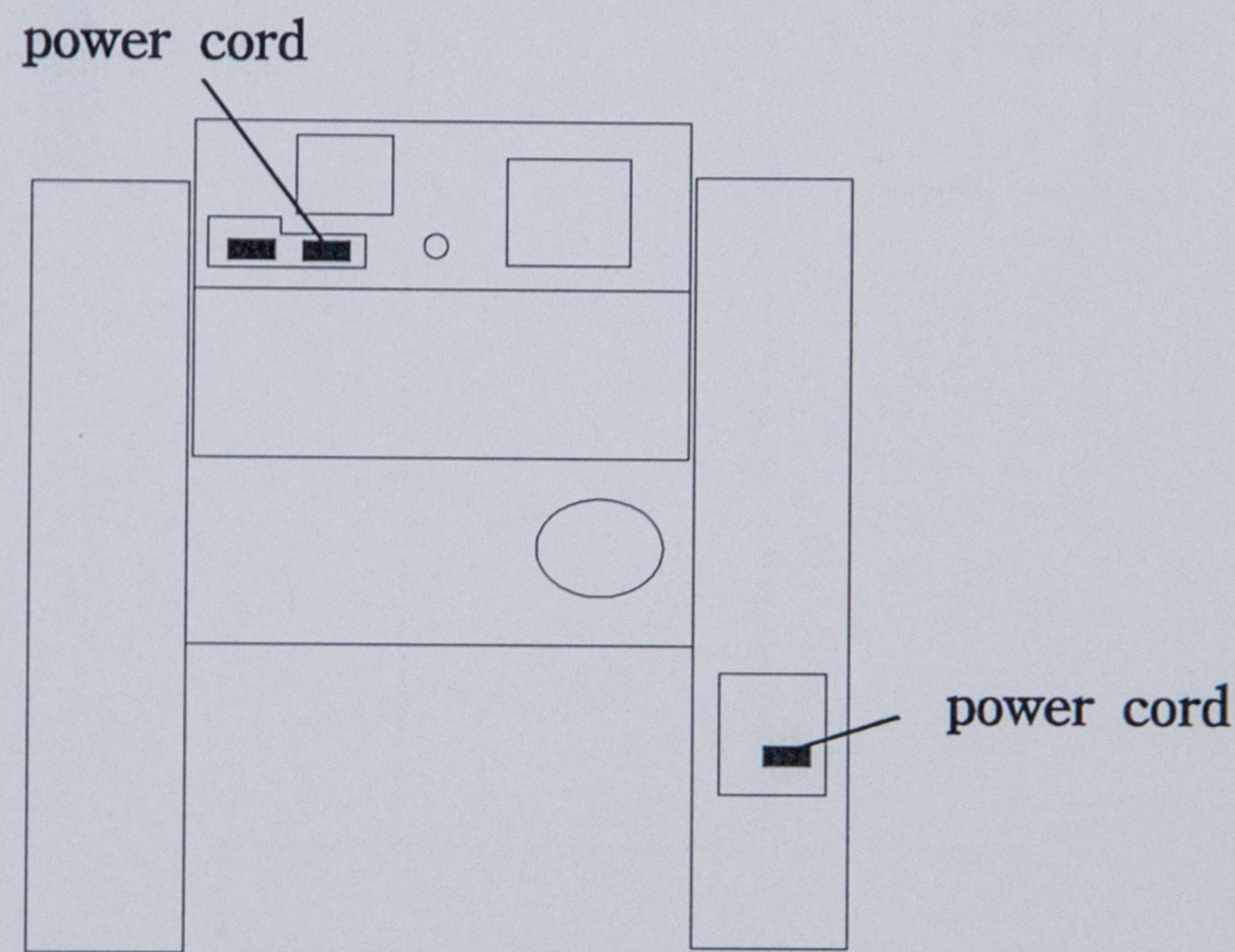
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## SECTION FOUR: Engraving Machine Setup

## Setup

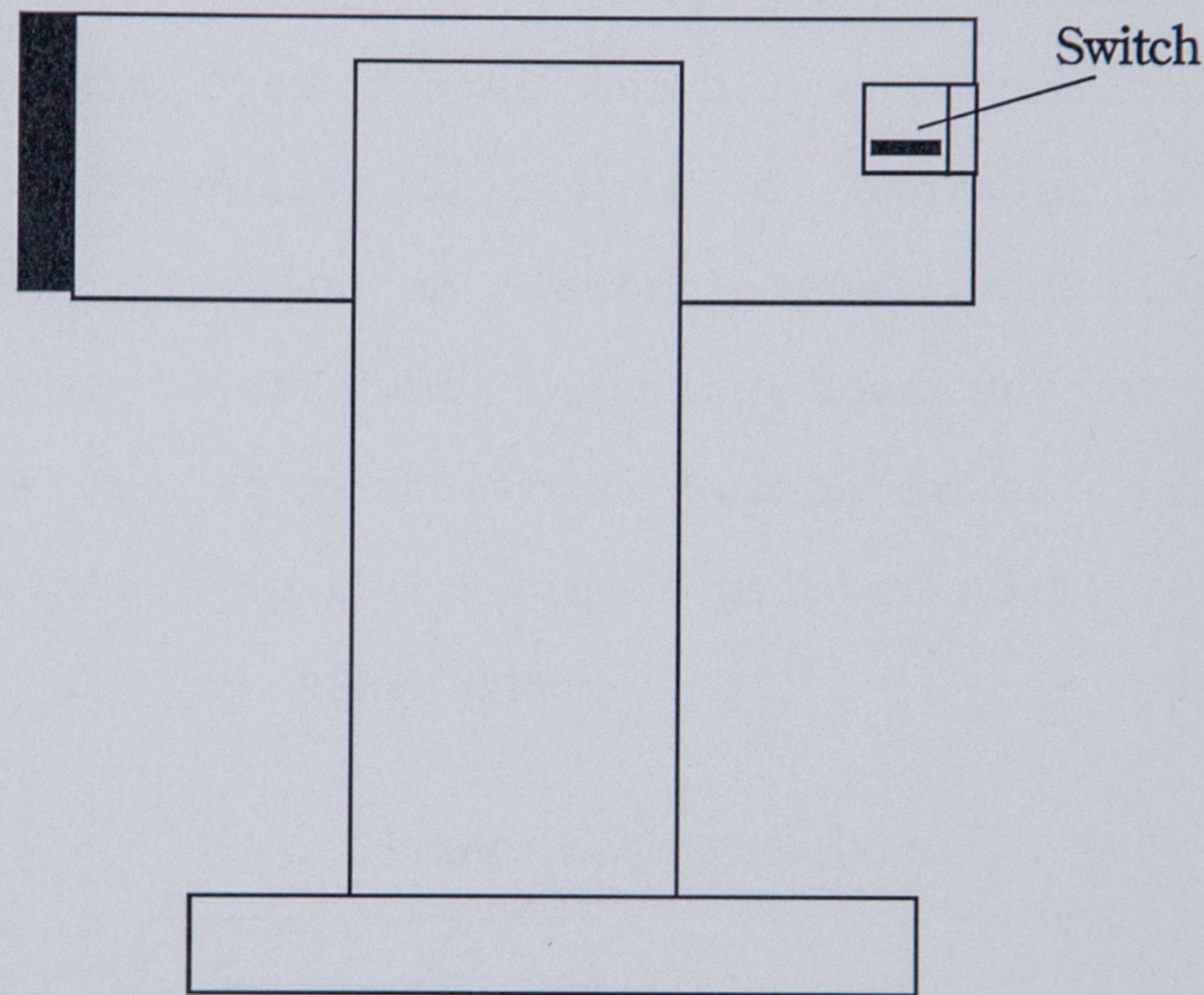
POWER: The laser and the engraving table have separate power systems, each of which requires a power cord. The locations for the two cords are shown below. Your engraver has been factory wired for 115 volt ac service (95 VAC - 130 VAC o.k.) Do not attempt to operate the machine on 220 volt service!

### REAR VIEW



The power switch is located on the right side of the machine near the rear panel. This switch controls power for the entire machine (engraving table and laser) and is the only switch normally used. The machine was shipped with the switch down (off or 0) and it should be left in that position for now.

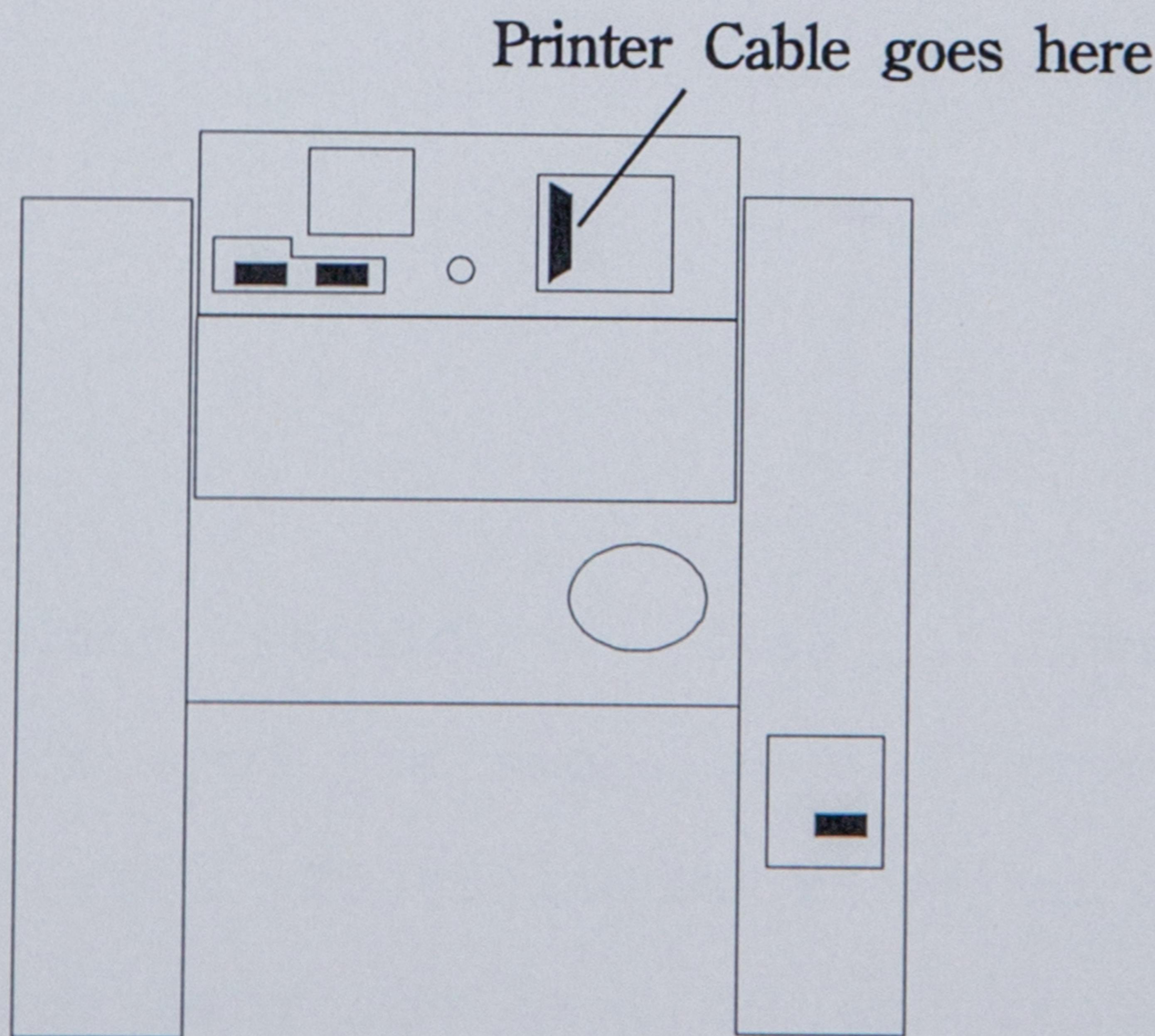
RIGHT SIDE VIEW



In addition to the main power switch, there is a key switch for laser security. The key has two positions, and can be removed in either position. Turning the key counter clockwise will deactivate the laser unconditionally. A spare key is provided, and should be kept in a safe place. The key is located on the rear laser power panel. The machine is shipped with the key in the "ON" (clockwise) position. The key is normally left in the "ON" position.

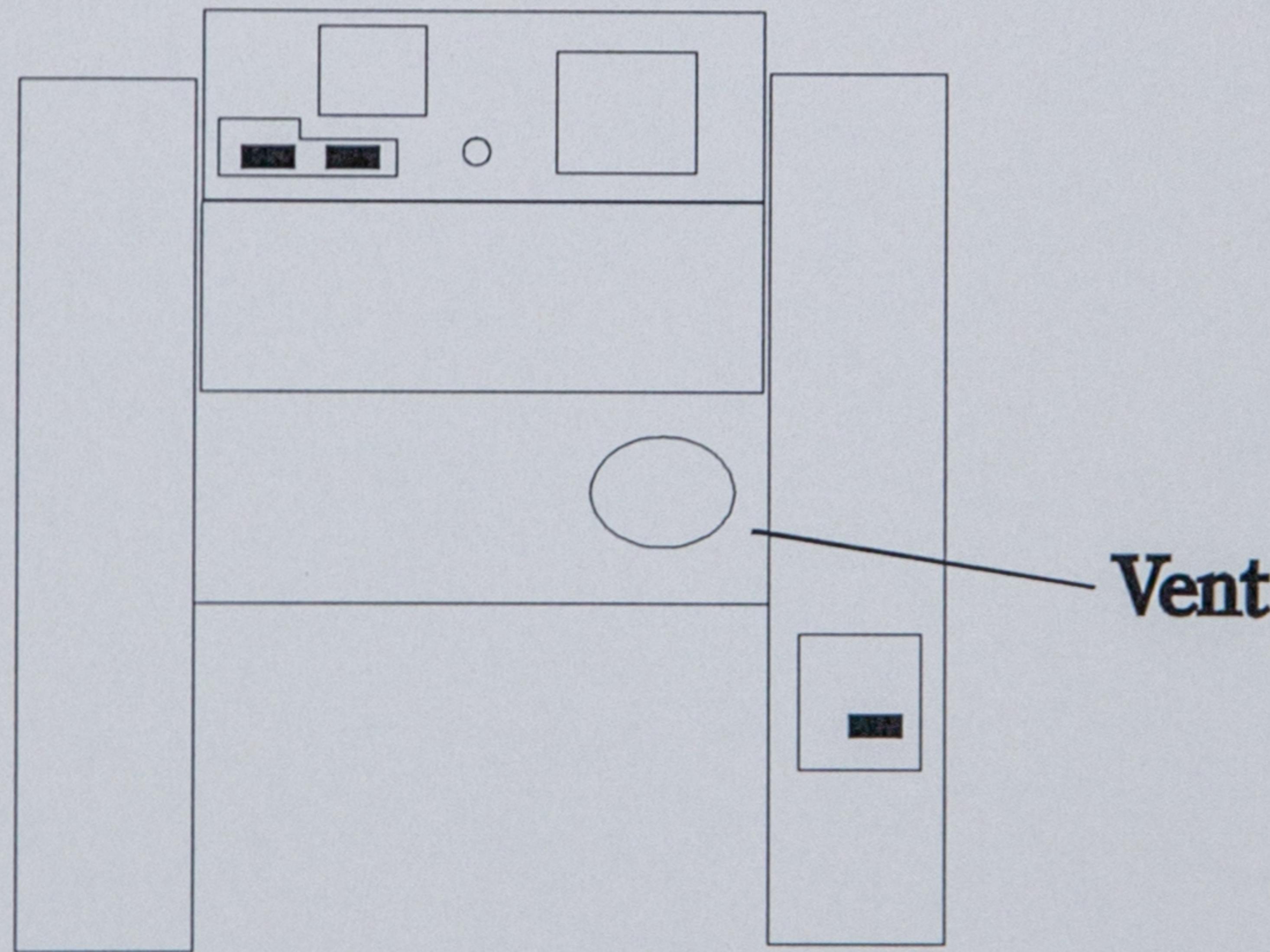
CONNECTING YOUR COMPUTER: Your Epilog engraver connects to your computer just like a printer. There are several possible configurations. The engraver may be connected directly, using the cable that was shipped with your engraver or any standard printer cable. If you wish to attach a Laserjet compatible printer and the engraver at the same time (good for proofing designs), Epilog recommends having your computer dealer install a second printer port (LPT2). The selection of printer or engraver is done with your mouse by clicking on 'Control Panel' and selecting the printer or engraver port. Epilog does not at this time endorse the use of mechanical 'Switch Boxes', which allow multiple printers to use a single printer port.

#### REAR VIEW



VENTING: Your Epilog engraver is equipped with a power ventilator to pull smoke and particulates out of the

engraving cabinet. The ventilator outlet, which is located on the rear of the machine, must be vented to the **OUTSIDE** of your building. The vent is intended to accept a four inch flexible hose. The flexible hose should connect to a rigid vent that goes through either an exterior wall or the roof. The vent should be routed away from areas where it would be likely to be hit by furniture or other equipment. Epilog also discourages trying to "patch in" to a vent that is in use by some other appliance. Differences in exhaust pressure may produce unexpected and unpleasant results, such as failure to properly vent the contaminants to the outside.



The vent should be free of obstructions. When engraving on wood the smoke should curve sharply away from the focus lens. If the smoke rises up to the lens without being pulled away the vent is too restrictive. You will need to reduce backpressure by shortening or straightening the vent tubes.

**WARNING!!!!**

Never operate the machine without a properly operating vent to the outside! Most material will only produce an irritating smoke when engraved. Some materials, including but not limited to paint, varnish, composition board and plastics produce compounds that can be harmful if concentrated. A properly installed vent is the only way to ensure that problems do not occur.

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## SECTION FIVE: Engraving Machine Operation

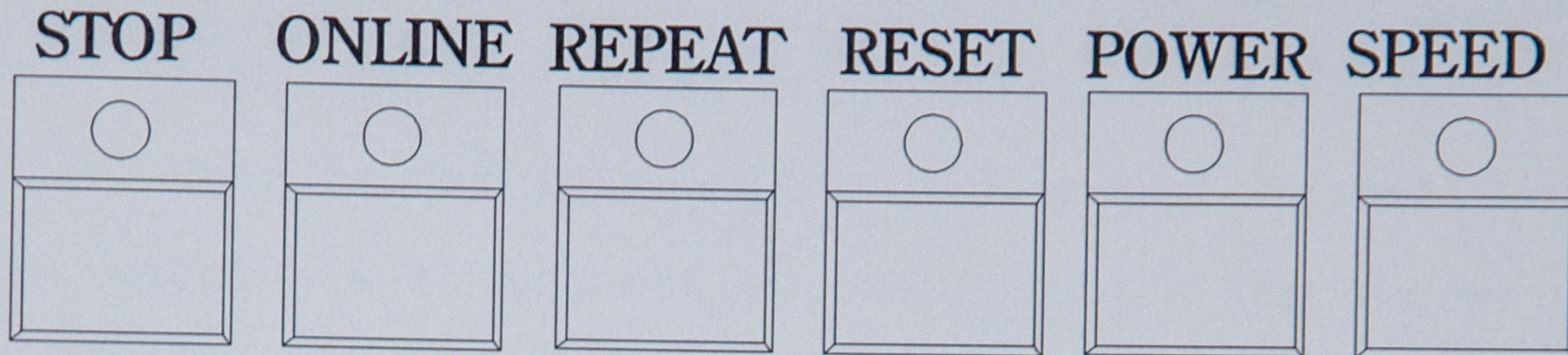
## Operation

Ensure that you have:

- 1) Connected the vent outlet to a duct that goes outside of your building.
- 2) Plugged your engraver into a 115 volt outlet.  
(two cords)
- 3) Connected your engraver to the your computer printer port.
- 4) Configured your computer with an application to print to a LASERJET 2000 printer

Now it's finally time to turn your engraver on. Flip the power switch to the ON (1) or upper position. The machine performs some internal testing for about 10 seconds, and then you should hear the table start looking for home. At this point, all of the keyboard lights should be OFF. Each key has a built in indicator light.

KEYBOARD: Your engraver control panel has six keys. They are as follows:



STOP: This key will stop the machine, turn off the laser and then release the door lock. The door will then pop open about one half inch so that can opened. Always be sure to take care when lifting the door - never drop or release the door until it is opened fully.

Online: This key enables the engraver to start. Pressing the key will toggle the light on and off. When the light is off the machine is in the disabled state and will not accept a design from the computer. When the light is on, the machine should be loaded with the item to be engraved and the door should be closed. When a design is received from the computer the engraver will automatically begin engraving. **Do not send a new design while the machine is engraving; if you do, your computer will display an error message and you may have other difficulties.** If the machine fails to start after sending a design, do NOT resend without first finding out why the machine didn't start. If you have

difficulty, reset the engraver and delete all pending print jobs by closing the WINDOWS 'Print Manager'

Repeat: This key instructs the engraver to repeat the last design. If the repeat key is pressed, the repeat light will come on. When repeat is enabled, just press the ONLINE key and the machine will restart automatically. The repeat key has no effect if no design has been sent by the computer. The repeat function is cleared at the end of each design, and is reactivated by pressing the key.

Reset: This key is used to terminate a job in process or to clear an error. To avoid accidental resets, the machine must first be stopped or offline. If the machine is running the key has no effect. Reset does not erase a design from memory.

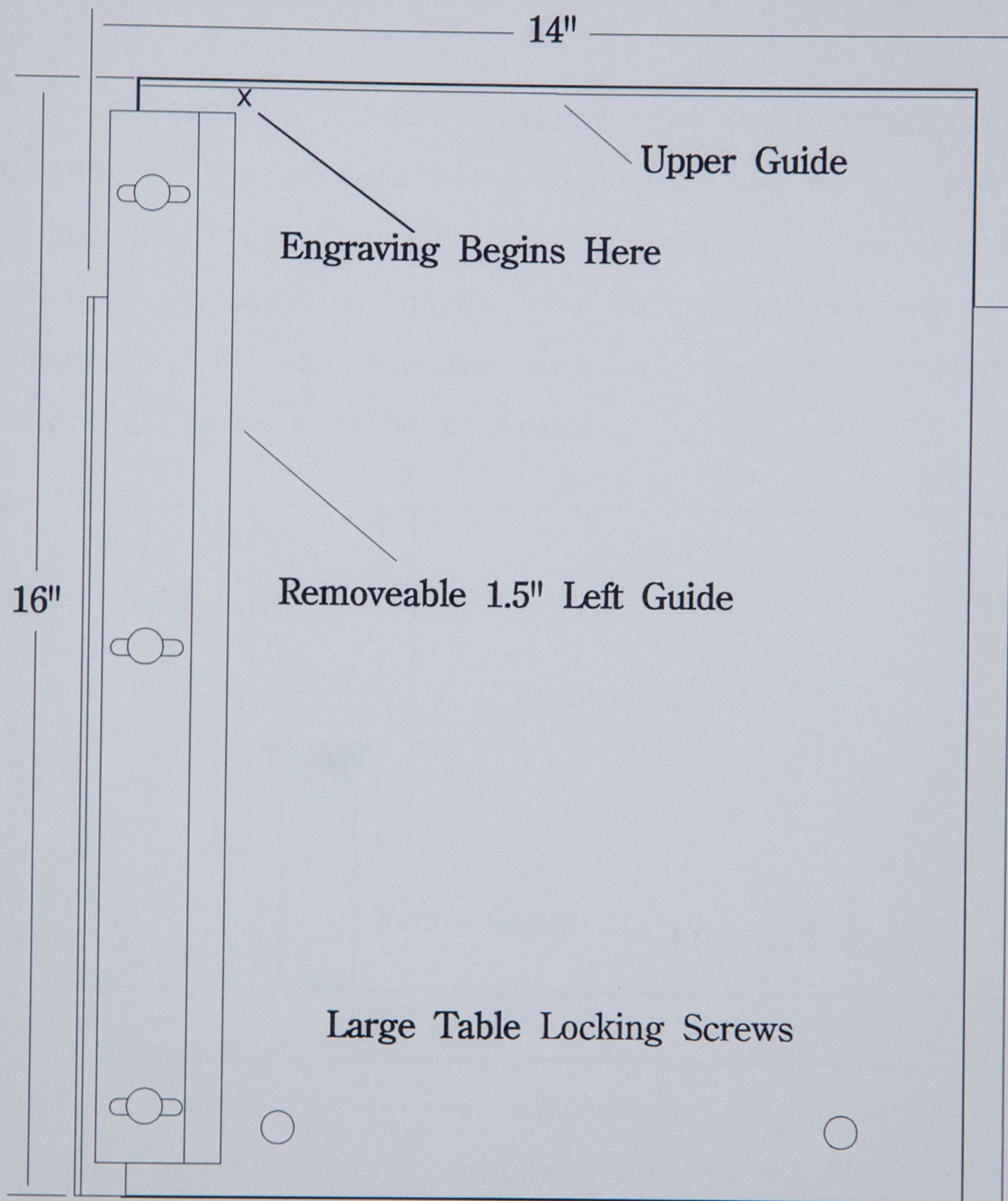
POWER: This key increments the engraving power by one setting. Six settings are available. The machine will power up to full power. While the key is depressed, the six front panel lights will indicate the power setting. Six lights on is full power. Incrementing past full power will set the power to setting one, or minimum. Press the power and reset keys at the same time to view power without having to alter the current setting. **Power can ONLY be altered prior to starting a job.**

SPEED: This key increments the engraving speed by one setting. Just like the power function, speed is displayed while the key is pressed. Six settings are available, with six lights indicating maximum speed. Press the reset and speed keys at the same time to view speed without having to alter the current setting.

LOADING THE WORK: The engraving field of your machine is approximately 11 by 16 inches. The upper table, which allows work up to 2" thick, measures 14 by 16 inches. The engraving field is centered on the table, leaving a one and a half inch area on the left and right sides that cannot be engraved. A removable left side insert defines the starting point of the engraving field as shown in the diagram on the next page. Normally, you would engrave with the insert in place. If your work won't fit with the insert, remove it but remember you cannot engrave on that area of your work. Please be aware that your graphics software may impose a small border within the engraving field that is not printable (typically 1/8" to 3/16").

The upper table is removed by loosening the two "Large Table Locking Screws", also shown in the diagram. The screws are captive, and should stay with the table when it is removed from the machine. Pull the table towards the front of the machine about a quarter inch, then lift the table out through the door. The smaller table underneath allows for work up to 4", with a field of approximately 10 by 12 inches. To reinstall the large table, just insert it with the four side tabs down and pointing to the rear of the machine. They fit into slots punched in the lower table. Once the tabs are inserted, push the table towards the rear of the machine until it is fully engaged. Then tighten the two locking screws to secure the table.

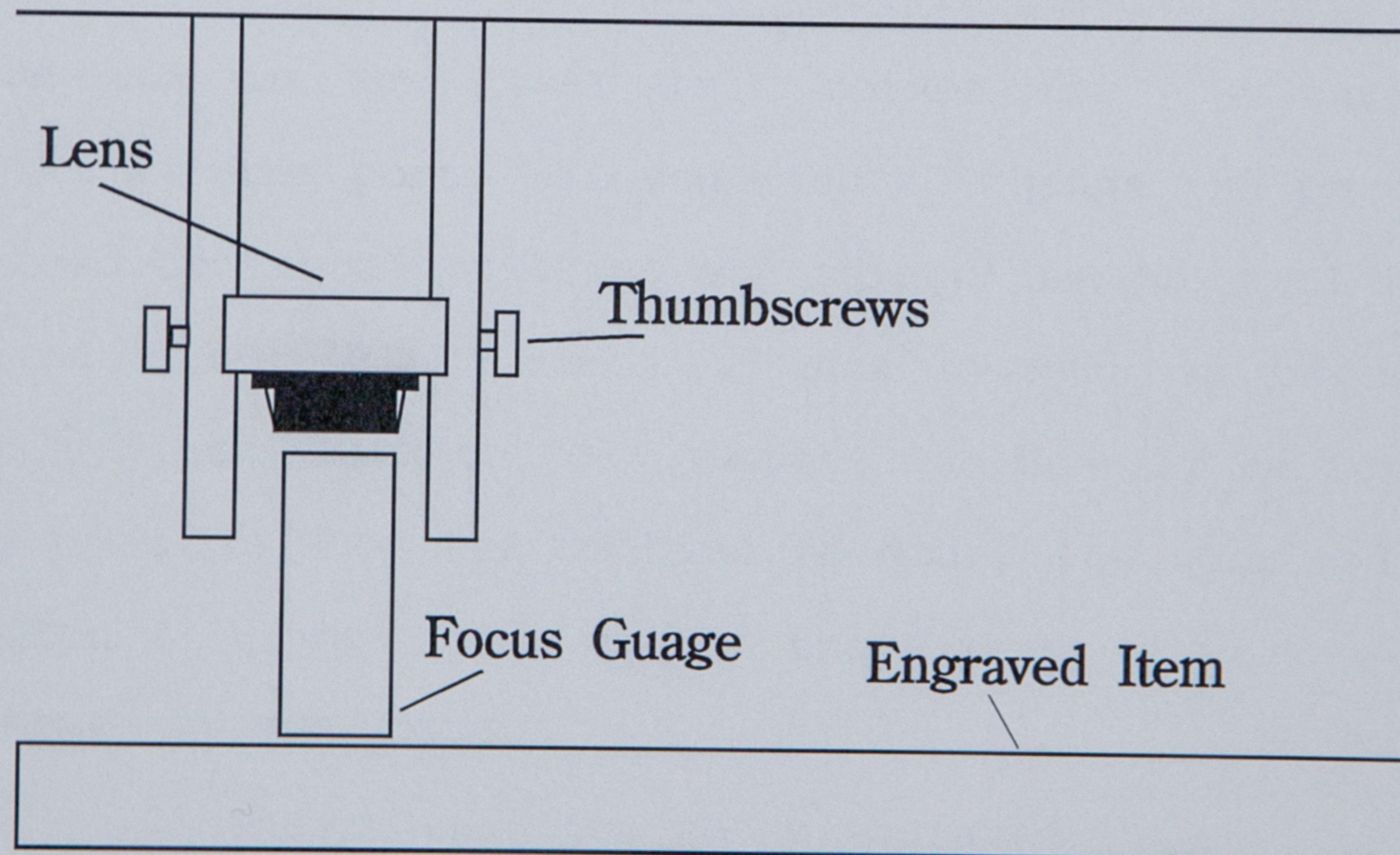
All 'Portrait' designs are upper left justified at the edge of the engraving area. 'Landscape' designs are lower left justified, and centering requires a little practice.



Fixturing of your work is simple. The table is magnetic, and you use one of the provided magnets included

with your engraver to secure the work in any position. The movement of the table is smooth, with no force applied to the work as is the case with a mechanical engraving tool. Experiment with some scrap items to see just how easy it is.

FOCUSING: The distance from the bottom of the lens holder to the surface being engraved must be two and a half inches. A plastic tube is provided with the machine and should be used to check the focus anytime new work is loaded. If the machine is not properly focused, your engraved image will be blurred.



To focus, loosen the thumbscrews and slide the lens up or down until it just touches the top of the focus tube. The adjustment is not critical.

POWERUP: Now it is time to test your machine. Load a practice plaque and set the focus if you haven't already. Close the door and press the ONLINE key. The light and

exhaust blower will power up when the door is closed. The ONLINE key should be lit up. Now go over to your computer and start WINDOWS, and then go into your application program (i.e. Coreldraw).

Set the page size to the dimensions of the work you have loaded (under the 'FILE' menu), and then enter your name in half inch text anywhere on the page. Once you have the image ready to go, just "click" the mouse on print. You have the option of going into printer setup, and take a minute now to do so. You should have the printer set to Laserjet 2000, paper size set to 11 x 17 (ledger), portrait mode, and 300 DPI. If you have multiple printer ports, look at the box in the lower left corner for the currently selected printer port. If you wish to change the port, you will need to cancel printing and select the 'Control Panel' (located under 'FILE' menu). Once everything is set up properly, just click on 'OK' and the design will be sent out for engraving. When the machine is done, the door will pop open with a 'thunk'. That is all there is to it.

REMEMBER THE STEPS:

- 1) Insert the item to be engraved
- 2) Focus
- 3) Close the door and press ONLINE

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## SECTION SIX: Laser Safety

## Laser Safety

The Epilog laser engraver is equipped with a safety enclosure. Any attempt to disassemble or modify this enclosure in any way may render it ineffective. The laser produces a very intense and INVISIBLE beam that can cause severe burns even at very great distances.

### **Do not attempt to operate the engraver with:**

- 1) Object caught in door.
- 2) Door that does not close properly.
- 3) Damaged door or lock.
- 4) Any cover removed or modified.

### **This is for YOUR safety!**

Your machine is equipped with a three way safety interlock to avoid accidental laser exposure. The door lock is controlled by the computer, and will only open the door after first turning the laser off. In addition, there are spring loaded pins that are released by opening the door deactivating both the control signal and the power to the laser.

Your engraver is also equipped with an emergency beam block that is located on the front of the left leg, just to

the left of the rear of the door. In the event of a laser emergency simply push in on the tab. The laser beam will be blocked mechanically. Please turn your machine off using the power switch any time you use the emergency beam block.

If you are concerned about unauthorized access to your machine, Epilog recommends that you remove the laser control key on the rear of the machine when it is not in use. If your engraving work involves the use of metals or mirrors, a set of standard safety or prescription glasses should be considered extra insurance, even though it is unlikely that the safety enclosure would ever malfunction. Epilog requires their use in all phases of manufacturing and test of our products.

In addition, a 10 pound fire extinguisher rated for electrical fires is a good item to have in your shop. Keep it in a very obvious place. Most municipal codes require all businesses to have a fire extinguisher available.

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SECTION SEVEN: Advanced Users

### Advanced Users

ENGRAVING SPEED GUIDELINES: Material hardness, the desired effect and personal taste will by nature require adjustments to the recommendations given below. Depth of cut varies with speed. More than one pass can produce exceptional depth (by using the repeat key). Generally, you will want to operate the machine at full power and adjust the speed for best results in order to maximize throughput.

Hardwoods (Oak, walnut) Speed 3 or 4 / Power 6

(Try adding sign maker's vinyl to highlight areas of your work. Apply it with soapy water to make placement and adjustment easier.)

Softwoods (Pine, birch) Speed 4 or 5 / Power 6

Anodized Aluminum Speed 6 / Power 2 or 3

Painted Metal Speed 6 / Power 1 or 2

(Some colored paint leaves a pigment film. Special laser metal is available from suppliers that will give excellent results.

Lexan Not recommended

Corienne (Fountainhead) Speed 2 / Power 6

Thick or Difficult Coating Speed 1 /Power 6

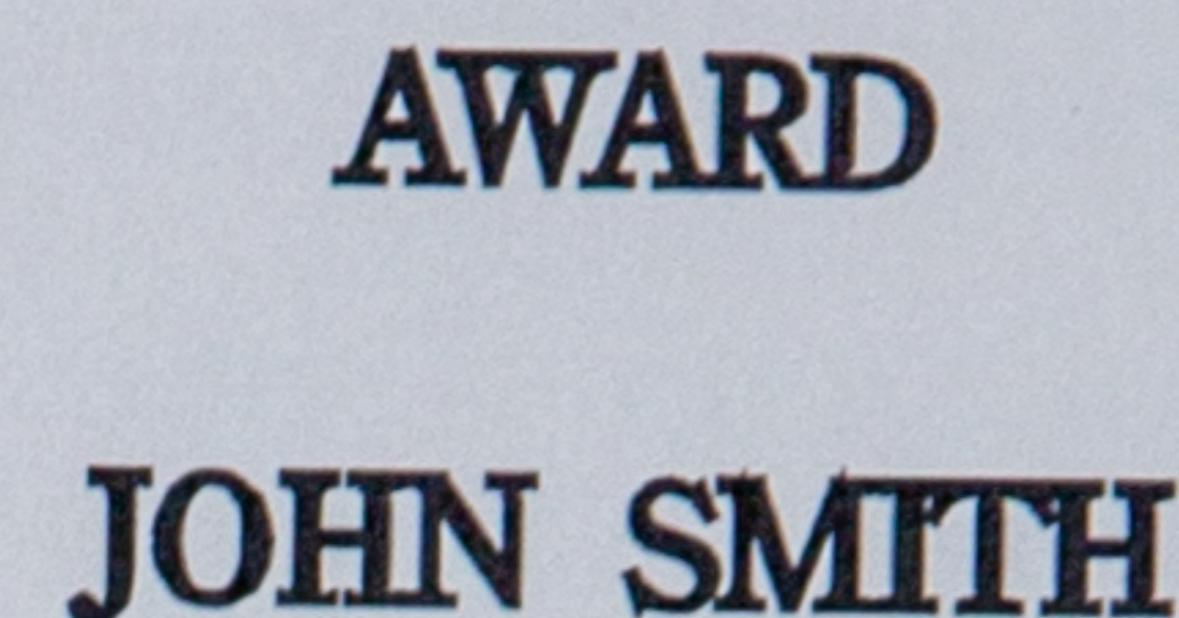
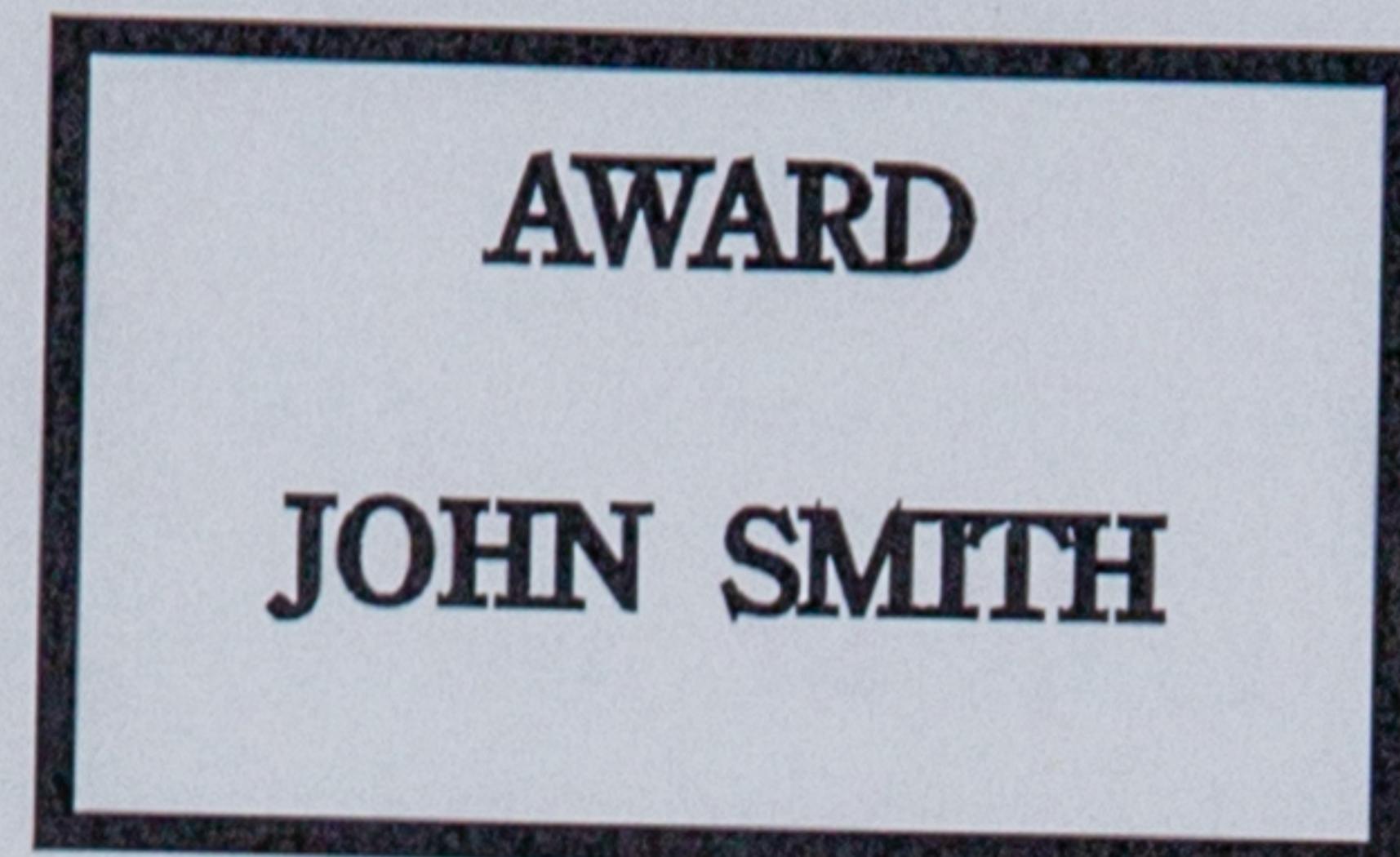
Glass Speed 5 to speed 6

(Glass may crack if engraved too slowly)

Plastics Speed 5 or 6 / Power 2 to 4

(Laminated plastics work best when the top layer has a matte finish and is as thin as possible.)

ENGRAVING TIME GUIDELINES: There is a considerable difference between typical and maximum engraving time for a given plaque size and speed. In the example below, the reasons for the difference are shown.



The design on the right will engrave in about one third of the time required for the design on left, even though the text and the number of characters are identical. The difference is the border. Engraving time depends on how much of the plaque's surface the laser must "scan". A border requires the laser to scan virtually the entire surface of the plaque. The design on the right has no border, and the laser only has to go over the lettering. Even the area between the top and bottom lines of text is skipped, greatly reducing the required engraving time. The machine will be more efficient if your designs allow the laser to work with a logo and text, as opposed to having to work strictly in terms of the number of square inches on the item to be engraved (which is the case with a border).

SPECIAL EFFECTS: Fill patterns can be used to produce a textured surface. A solid black fill will produce the maximum depth. "Grey" fills will produce areas of reduced depth, which can be controlled by the relative dark or light level of the fill. Essentially, a non-solid fill has the effect of reducing the laser power level. Use "grey" fills with some discretion though - they use lots of memory! Fills can be used to reduce the effective power level for very soft materials that burn too deeply even at maximum engraving speed. Fills look particularly good on glass.

FOCUSSING: Some material may actually produce a more pleasing effect if they are cut slightly out of focus. The results will typically be a little smoother and softer (edge definition) if the lens is set a little higher than the standard two and a half inches. Try making some spacers of 1/16", 1/8" and 3/16" to put between the top of the focus block and the lens. This will allow you to set the machine into a repeatable "soft focus".

RESOLUTION: Laser printers typically support a low, medium and high resolution. The engraver supports only the high resolution mode (300 Dots per Inch). The medium and low resolution are normally used only to decrease printing time for draft copies. With the engraver there is no decrease in engraving time to offset the reduction in quality. Designs must always be engraved at 300 DPI. An error will occur if you print at other than 300 DPI.

**PORTRAIT & LANDSCAPE:** Laser printers normally use a page that is rectangular (one side is longer than the other). In PORTRAIT mode, the image on the computer screen is printed just as you see it. In LANDSCAPE mode, the image is rotated 90 degrees prior to printing. The rotation has a small effect on printing time with a laser printer, but can carry a huge time penalty with your engraver. Engraving should normally be done in PORTRAIT mode, with text reading from left to right. Landscape should be used only when necessary. LANDSCAPE mode is referenced to the LOWER left hand corner of the table.

**Oversize Work:** If you have a large item that needs to be engraved, you can shim it up to clear the top guide on the table. Generally, this is only useful if the image to be engraved is smaller than the part it is to be engraved on. Anything that extends beyond the top edge of the table is outside the engraving field. However, oversize images can be engraved if the design can be split into two sections. By inserting the work upside down on shims (to clear the table backstop) you can engrave the top of the work with an image that has been rotated 180 degrees. Then spin the work around and send the balance of the design with a normal orientation. The method is difficult and requires practice.

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SECTION EIGHT: In Case of Difficulty

### In case of difficulty

Problem: Computer displays "problem writing to LPT1"

Solution:

1) Is the engraver ONLINE ? (Press ONLINE key) .

2) Is the printer cable(s) connected correctly?

Review the hookup configuration.

3) If you have multiple printer ports use 'CONTROL PANEL' to select the correct port.

4) **Always use print manager to terminate ANY print job that didn't transmit properly.** Do not leave part of a design waiting for transmission. Sending another job with a stalled job will not produce another error message!

Problem: Nothing happens when you print.

Solution:

1) Close or clear Print Manager, reset the engraver, and reprint your job. Don't try to reprint a job after an error without clearing print manager.

Problem: Engraver won't start and error (reset) light is on.

Solution:

The engraver had a problem with the design sent from the computer. Terminate the print job using WINDOWS print manager. Reset the engraver and

then try to reprint the design. Possible causes are:

- 1) Transmission error (resend the design).
- 2) Unknown Command (are you using approved graphics software? If you aren't, and the error repeats, you may have an incompatibility.
- 3) Design too large to fit in memory. You may need to simplify your design. Eliminate shading and replace with solid fills, or make the design smaller. Alternatively, you can break the pattern into two designs and send the second after the first is complete. Additional memory is available.

- 4) Incorrect printer driver. Use the laserjet 2000 printer driver. Using the wrong printer driver will cause errors. Please see section three.

Problem: Engraver starts but stops immediately without doing any engraving.

Solution: Preview your design to be sure that your image is what you intended. White letters on a white background will not engrave.

Problem: Engraver Starts but stops before finishing, and the error (reset) light is on.

Solution: The engraver had an internal error. Probable causes are:

- 1) Excessive temperature (The laser is overheating. Check and/or clean the four laser cooling filters. Is the room temperature above the machine's rating of 85 degrees Fahrenheit?)
- 2) Computer malfunction (If this error reoccurs your machine probably needs service).
- 3) Data transmission problem telling the machine to go to a location it cannot reach.
- 4) Incorrect printer driver. The correct driver is the laserjet 2000

Problem: The machine appears to be running normally but no engraving occurs (laser not operating).

Solution:

- 1) Laser Control key is not in and "on".
- 2) Laser circuit breaker is open (located next to the control key. If the center is out away from the body, press it back in flush. Do not reset the breaker more than one time.)
- 3) Emergency shutter is activated (pull it back out).
- 4) Door not shut fully.
- 5) Lens height (focus) not set right.
- 6) laser not plugged in to wall outlet.

Problem: Blurry or erratic image

Solution:

- 1) Lens height (focus) not set right.
- 2) Dirty focus lens (See Section Nine).

3) Pattern is too close to edge of engraving field. Increase your borders by .25 inch.

Problem: Machine makes a grumbling sound for a few seconds and then the error light comes on.

Solution: Something is preventing the machine from reaching home position. Does your work overhang the front edge of the table?

Problem: Engraving is not centered properly.

Solution: Recheck your work dimensions, and ensure that the page size on your software is set accurately.

Using construction lines is a helpful tip to ensure that you maintain even borders.

Problem: Extreme right half of engraved design is missing on larger workpieces.

Solution: Check the printer driver by printing and clicking on "printer setup". Make sure you have the laserjet 2000 driver with an 11" x 17" page size selected.

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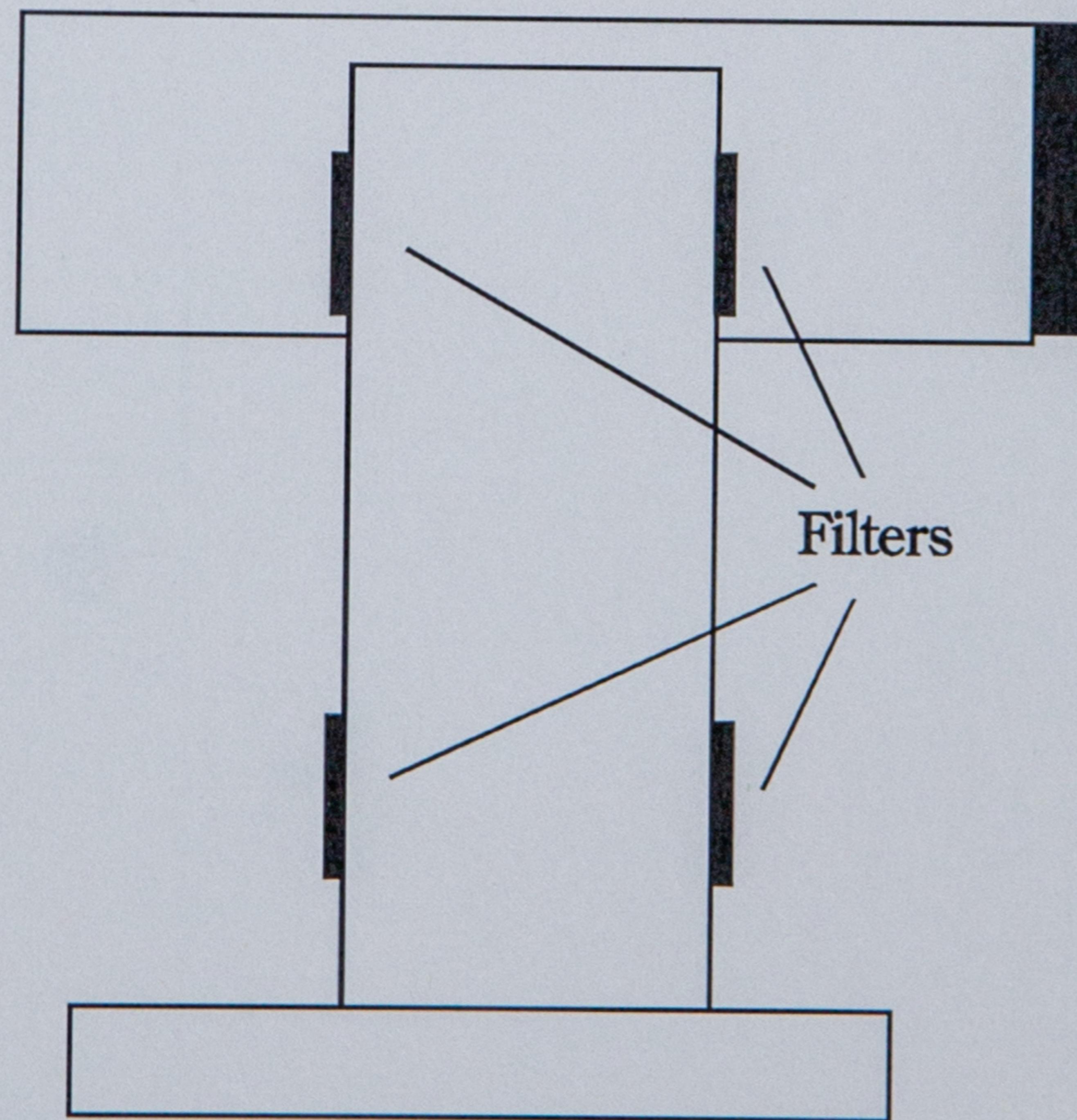
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## SECTION NINE: Engraving Machine Maintenance

## Maintenance

There are a few items that should be checked regularly to assure optimum operation of your engraver.

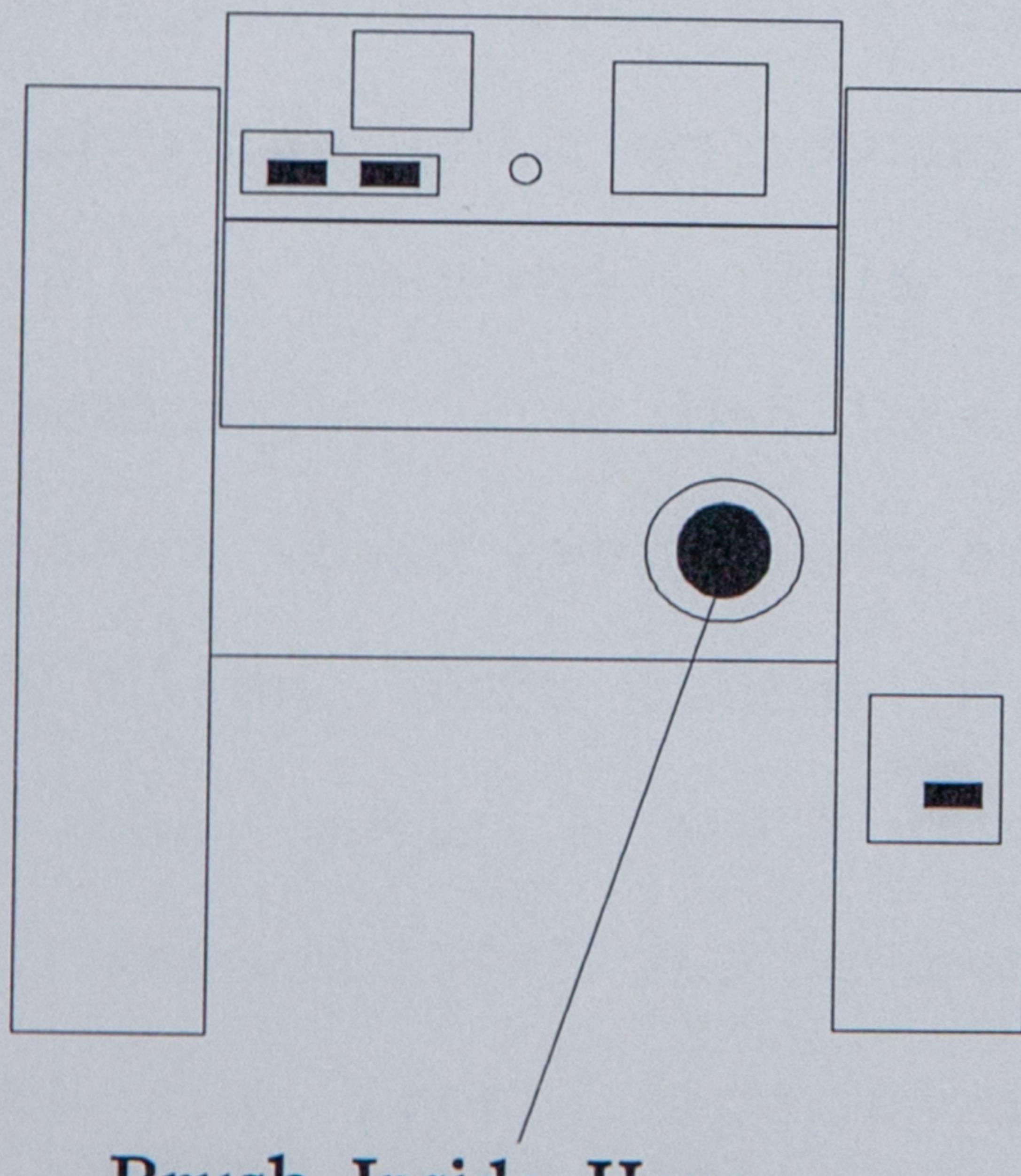
LASER COOLING FILTERS: There are four filters for the air that cools the laser. These should be checked visually at least once a week. If there is an accumulation of lint or dust, the filters should be removed and washed with warm soapy water. Rinse them well before reinstallation. The filter covers snap into place with four locking tabs. The covers can be removed without tools by pushing with your thumbs on the face of the cover just below one of the tabs (it should rotate a little bit) then pulling the cover off with your fingers. The locations of the four filters are shown below:



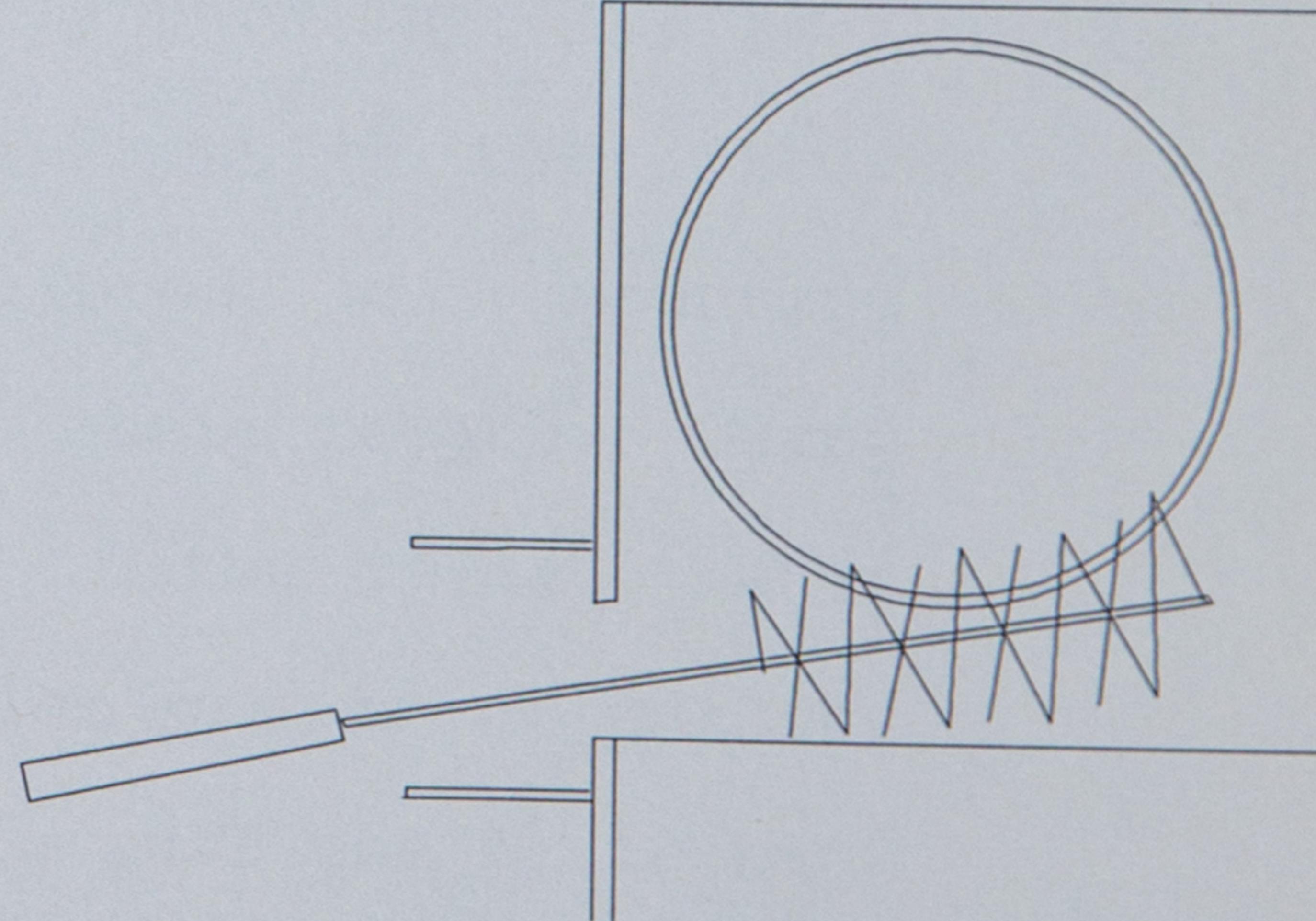
Don't be distressed if you break one. We'll be happy to send you a free replacement. Please don't be afraid to try. It is very important that the filters be kept clean.

**BLOWER:** The blower built into the base of your engraver requires periodic cleaning to maintain efficiency. How often this must be done depends on the amount of use and material you engrave on. Normally, once every three months should be adequate. You may need to clean more or less frequently. If you detect odor while engraving, or the smoke appears to be moving around more than when the machine was new, you should clean the port.

To clean, simply disconnect the dryer hose and insert the bottle brush from your accessory kit. The blower element is circular, and just inside and above the opening. Using both a side to side and a back and forth motion, spin the blower element as you clean it. Use a small vacuum to clean up the debris.



**Brush Inside Here**

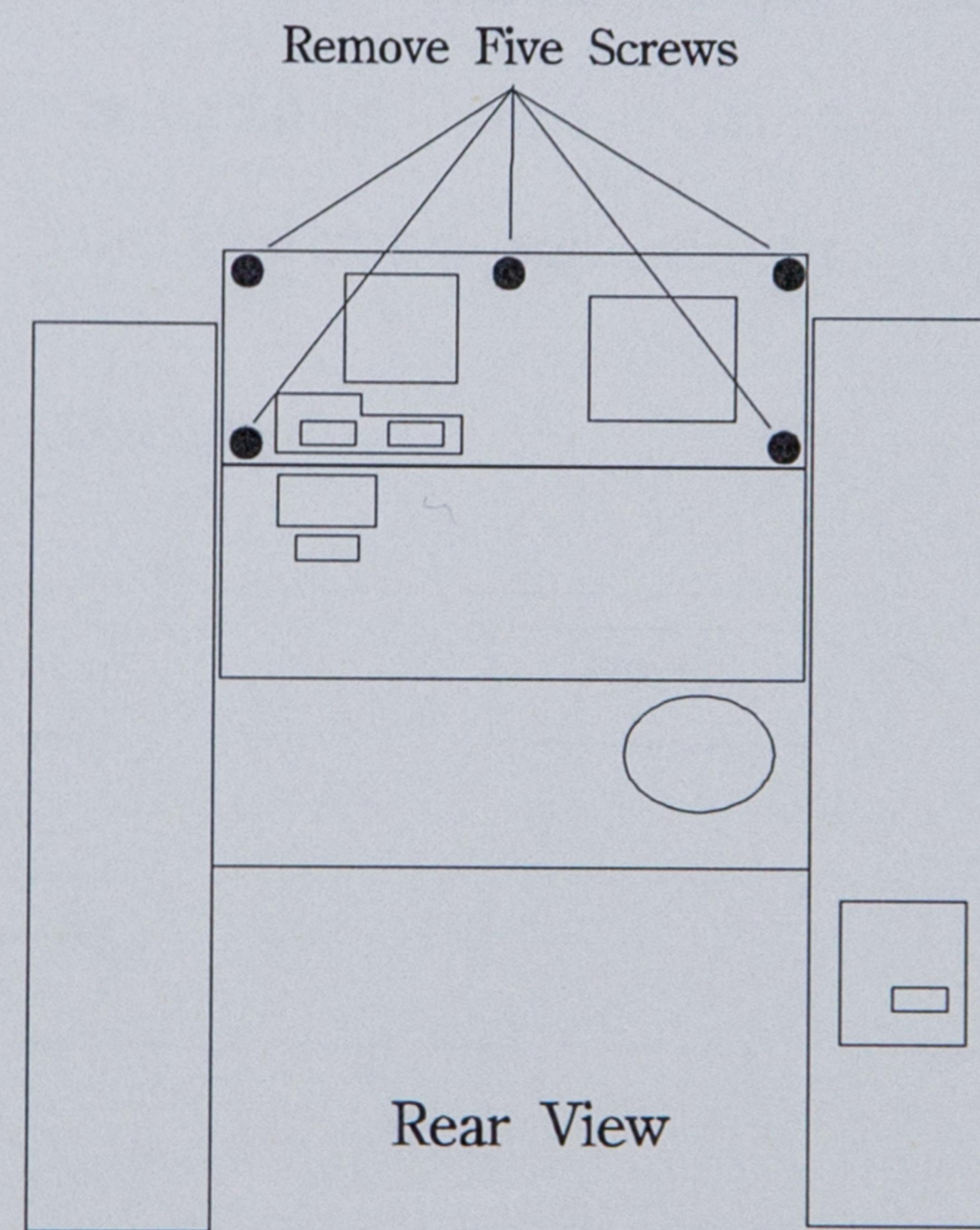


For a more complete job of cleaning, the front blower panel can be removed. Using a slotted screwdriver, loosen the two captive screws that hold the front blower panel on.

The panel is located between the legs of the machine, below the engraving cabinet. With the panel removed, use a shop vac with a bristle attachment to remove all the debris. You may need to scrub just a bit. Clean the outside of the blower as well. Annually, you should put a few drops of oil ont the blower bearings.

**BEARINGS:** The two linear bearings below the engraving table should be cleaned and lubricated on a periodic basis. The bearings generally do not require any service, but you will find your engraving quality will be at a peak with a clean bearing system. The following procedure should be followed about every three months, depending on how often you use your machine. Unplug both the engraver power cords. Remove the upper table by loosening the two captive screws and pulling the table out through the door. Then carefully push the lower engraving table completely back into the rear of the machine. This will expose the front of the linear bearings. The bearings are silver colored, with mounting holes about every inch and a half along their length. Using a clean, soft cloth, wipe the length of the rails. When clean, apply a small quantity of lithium grease or quality lubricant (TRI FLO is recommended). Now pull the table back to the front, and clean and lubricate the back of the bearings. The proper place for the lubricant is on both **SIDES** of the bearing rails, just below the top. If you look closely you'll see the half circles that the ball bearings actually ride in, which is where the lubricant belongs.

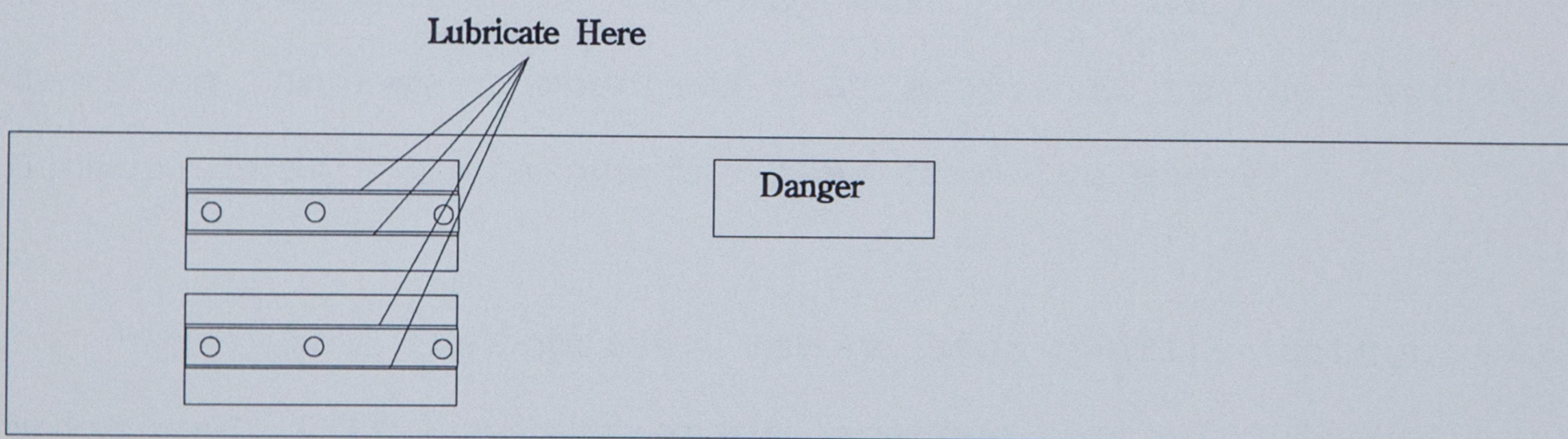
The carriage bearings require less frequent service. If you use your machine normally, they should be lubricated only once or possibly twice a year. To access them, remove the two power cords and then the upper cover. The cover is removed by removing the rear panel screws shown in the diagram on the next page. Be careful NOT to remove the four power supply screws, which are located in the same area. If you are uncertain, the power supply screws form a box around the fan and power cord area.



Once the screws are removed, there are two shipping locks that need to be removed. These need only be reinstalled to ship your machine. Just inside the door, on the left and right side, you will see two black thumbscrews just like the ones on your lens holder. Loosen and remove these, along with the small brass barrel and lockwasher.

Leave the door open at this point. The cover cannot be removed with the door latched closed. Now your cover can be slid forwards. It should be a little difficult to move initially, then slide freely about 3 inches to a stop. At this point, lift the cover up and set it aside. The cover is large, and you may need someone to assist. Be careful the door doesn't close on your fingers when you move or lift it.

The carriage bearings are located under the gold cover that is located in the center of the machine. There are two rectangular cutouts for lubricating the two carriage linear bearings. The bearings look similar to the table bearings, only smaller. The cutouts are shown in the drawing below.



Push the lens carriage all the way to the left, and place a small quantity of lubricant on the both rails. Then move the carriage to the right and lubricate both rails again. When replacing the upper cover, please don't push the door into the closed position. The door must be either fully open or resting on the springs. Place the cover back down just as you took it off, and once it's in place, slide

it back against the rear panel. The upper and lower cover will line up if it is on correctly. Then replace the five rear panel screws.

OPTICS: After many hours of operation, it may be necessary to clean the optics (mirrors and lens) of your Eclipse laser engraver. If smoke, resin, or other contaminants are allowed to accumulate too heavily, they will reduce the available laser power and may even cause damage.

The two optical components most likely to require cleaning are the focus lens and the mirror directly above it. Both are located on the carriage. The focus lens mount may be removed from the engraver, for easy access, by removing the two thumbscrews that secure it to the carriage. Do not attempt to remove the lens from its mount!

To clean the optics, use a high-quality cotton swab moistened with reagent-grade acetone, ethyl alcohol, or anhydrous isopropyl alcohol. These may be obtained from a chemical supply house. Do not use rubbing alcohol or "hardware store" solvents such as denatured alcohol, as they contain impurities which can contaminate the optics. If chemicals are not readily available in your area, you may obtain pure ethyl (grain) alcohol at any liquor store, under such brand names as "Golden Grain" and "Everclear." Wet the swab thoroughly with the solvent, and then blot it against a

paper towel or piece of cotton so that it is no longer soaking-wet. Then daub the optic gently, rotating the swab after each daub to expose clean cotton to the surface, until the optic is free of visible contamination. At that point, prepare a fresh swab and clean the surface with a gentle zig-zag motion across it. Avoid any hard "scrubbing" of the surface, especially while there are visible particles on it, and try not to use repetitive circular motions. When you are done, be careful to remove any cotton threads that may have snagged on the mountings, and allow the optics to dry before you operate your engraver.

The best way to keep your optics clean is to make sure the blower system is working efficiently. The smoke should never get near the lens. If the blower isn't cleaned periodically, the smoke will linger in the engraving area and settle on the optics.

LASER: The laser tube used in the Epilog engraver does have a maximum service life. The amount of engraving time that you get from a tube will depend to a large extent on how much material you remove from your plaques. Typical tube life is 1500 hours, operating. Most plaques will run the laser 30 to 50 percent of actual engraving time. Depending on your particular usage, the tube should be good for 3000 to 4000 hours of engraving, or about two years based on an eight hour shift. The tubes are refurbished and are available on an exchange basis.

LIGHT: The work area light uses a standard automotive instrument bulb (Number 194, available at most discount stores with an auto department). To change the bulb, the machine must be turned off with the door open. Remove the two Philip head screws that secure the light cover, and the bulb can be removed by pulling gently with your fingers. When you reinstall the cover just make sure that the opening faces down.

# Epilog

Denver Colorado, USA

SECTION TEN: Appendix

## Appendix

### A) Cable / Signal assignments

SIGNAL	PIN NUMBER	PIN NUMBER	SIGNAL
-STROBE	1	19	GND
DATA1	2	20	GND
DATA2	3	21	GND
DATA3	4	22	GND
DATA4	5	23	GND
DATA5	6	24	GND
DATA6	7	25	GND
DATA7	8	26	GND
DATA8	9	27	GND
-ACK	10	28	GND
BUSY	11	29	GND
ERROR	12	30	GND
SELECT	13	31	NC
NC	14	32	-FAULT
NC	15	33	AUX1
0 VDC	16	34	NC
CHASSIS	17	35	AUX2
NC	18	36	NC

## B) Control Language

The Epilog laser engraver is programmed to interpret the **CURSOR POSITIONING** and **GRAPHICS** commands of HEWLETT-PACKARD'S Printer Control Language (PCL). These are the commands used by the WINDOWS laserjet II printer driver. The PCL language has many additional commands that are **NOT** interpreted by the Epilog engraver. Most of these have to do with items that are not appropriate for an engraving machine, or have to do with aspects of laserprinters that we do not support( such as pluggable or loadable fonts). The commands supported by the engraver are listed below. A complete listing of the PCL language is provided in the manual for any HEWLETT-PACKARD laser printer.

### Raster Graphics Resolution

ESC\*t#R # = 300 DPI

### Start Raster Graphics

ESC\*r0A

### Set Compression Mode

ESC\*b0M Unencoded ONLY

### Transfer Raster Data

ESC\*b#W # = number of bytes

### End Raster Graphics

ESC\*rB

### Orientation

ESC&l#0 # = 1 (portrait) 0 (landscape)

Horizontal Cursor Positioning

ESC\*p#X # = dot position

Vertical Cursor Positioning

ESC\*p#Y # = dot position

Engraver Reset

ESCE

### C) Theory of Operation

The epilog laser engraver is a State of the Art machine, utilizing the latest developments in laser technology coupled with advanced desktop publishing. By emulating a laser printer, the user is allowed access to almost unlimited typefaces and electronic art.

The laser is a sealed unit, requiring only electrical power and cooling to produce 25 watts of laser power. Excitation is RF (Radio Frequency 45Mhz) discharge, eliminating the need for bulky and expensive high voltage power supplies. Cooling is by forced air.

The engraving process takes place when the energy of the laser is concentrated into an area less than five one thousandths of an inch in diameter. Most material is rapidly consumed. The laser is moved over the surface of the item being engraved according to the image loaded in memory, removing material in the desired pattern.

The engraving method is RASTER. A raster image is made by moving the laser from side to side, advancing by the width of the laser spot between lines. The laser is turned off and on at just the right intervals to produce the image. Raster images are the native language of laserprinters, and they produce an image in a nearly identical manner. If you

watch your machine while it is engraving, you can better understand exactly how the image is assembled. The lens will travel from side to side, and at the end of the motion the table carrying the work will advance.

The laser beam itself is invisible. The beam is about half the diameter of a #2 pencil. Unfocussed, it will just make an ugly burn, leaving lots of charred material behind. The focus lens gives the beam an hourglass shape. At the center point the energy density is concentrated, allowing the very precise and clean material removal that is characteristic of laser engraving. That is the purpose of the focus gauge. Exactly two and one half inches from the bottom of the lens is the smallest spot, and that is where you want the engraved item to be.

The lens carriage uses a DC Servo system with a linear encoder for position feedback. The linear encoder allows for extremely accurate switching of the laser. You will find that the Epilog engraver has very accurate edge definition, even under magnification. If you have a microscope, a close examination of laser engraved items is an interesting exercise.

The engraving table is controlled by a high resolution Stepping motor. The motor has a half step angle of 0.45 degrees, which allows for very accurate and smooth motion. The step size, or increment of the table is fixed at the standard laser printer resolution of 300 Dots Per Inch.

The electronics inside the engraver are based on the same technology you have in your personal computer. It is not uncommon for laser printers (in this case engraver) to have a computer chip that is equal in power to many popular computers. The chip used in the engraver is an 80286, with up to four megabytes of RAM and 128 kilobytes of ROM. The program is in ROM, and the machine will power up fully without any attachment to a host computer. The interface and control of the laser is the result of several years of development, and represents state of the art in terms of accuracy and speed.

Government regulations require that laser products be provided with certifications and safety labeling. The Epilog Model 1000/25A (Eclipse) laser engraver has a certification / identification label on the cabinet rear, and enclosure safety labels on the cabinet rear and on the laser assembly and mirror carriage cover inside the cabinet.

Reproductions of these labels are shown below.

### Epilog Corporation

6330 N. Washington Unit 12  
Denver, Colorado 80216 USA

Model Number: 1000/25 Laser Engraver  
Serial Number: XXXXXX  
Date of Manufacture: XXXXXX xxxx

### Class I Laser Device

This product complies with 21 CFR 1040.10

DANGER - Invisible laser  
radiation when open.  
AVOID EYE OR SKIN EXPOSURE  
TO DIRECT OR SCATTERED  
RADIATION.